

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 December 2001 (13.12.2001)

PCT

(10) International Publication Number
WO 01/93785 A3

(51) International Patent Classification⁷: **A61F 2/44,**
B29C 67/00, B22F 3/105

(21) International Application Number: PCT/US01/18160

(22) International Filing Date: 5 June 2001 (05.06.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/588,167 5 June 2000 (05.06.2000) US
60/291,183 15 May 2001 (15.05.2001) US

(71) Applicant (for all designated States except US):
TENSEGRA, INC. [US/US]; 110 Kerry Street, Norwood, MA 02062 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **MANASAS, Mark** [US/US]; 25 Trimount Street, Dedham, MA 02026 (US). **OSLAKOVIC, Keith, E.** [US/US]; 114 Walden Street, Cambridge, MA 02140 (US). **SULTAN, Cornel** [US/US]; 17 Webster Street, Apt. 4, Everett, MA 02149 (US). **HAMILTON, John, V.** [US/US]; 31 Hill Street, Foxboro, MA 02035 (US). **INGBER, Donald, E.** [US/US]; 71 Montgomery Street, Boston, MA 02116

(US). **SAMMARCO, Carmine** [US/US]; 12 Orchard Street, Medfield, MA 02052 (US). **KUMMAILIL, John** [IN/US]; 45 Auburn Street, #3, Framingham, MA 01701 (US). **SKINNER, David, J.** [GB/US]; 22 Claire Avenue, Mansfield, MA 02048 (US).

(74) Agent: **ANASTASI, John, N.**; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).

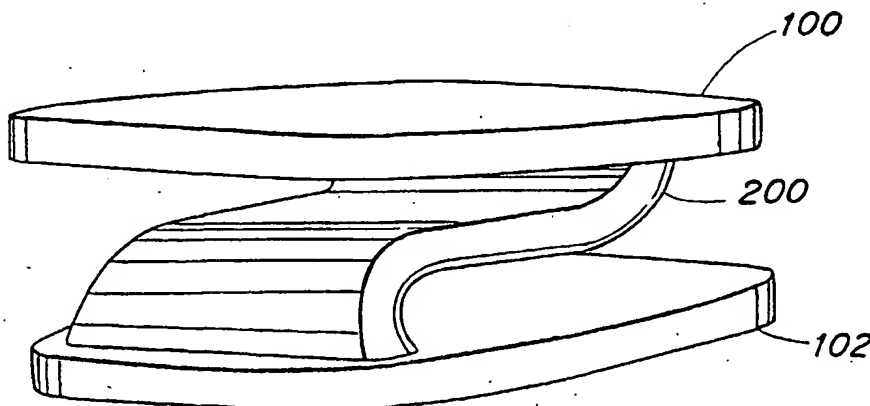
(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

[Continued on next page]

(54) Title: ORTHOPEDIC IMPLANT AND METHOD OF MAKING METAL ARTICLES



(57) Abstract: The present application is directed to an orthopedic implant. More specifically, the orthopedic implant is suitable for arthroplasty procedures where optimized multifunctional behavior of the implant is desired. In some embodiments the implant is suitable for the replacement of a spinal disc. In one embodiment, the present application is directed to an orthopedic implant including a first plate a second plate and a flexible support. The flexible support may have a single connection to the first plate and a single connection to the second plate and may vary in cross section. The first plate, the second plate and the flexible support may be unitarily formed. This application is also directed to methods of producing metal articles having microstructure for improved mechanical properties. Such methods may be suitable for the production of medical devices. In one embodiment, the method includes directing a stream including a particulate material in a pattern corresponding to at least a portion of a structure of an orthopedic implant and fusing at least a portion of the particulate material with a laser.

WO 01/93785 A3



(88) Date of publication of the international search report:
11 April 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

national Application No

PCT/US 01/18160

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61F2/44 B29C67/00 B22F3/105

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C B22F A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	US 6 144 008 A (RABINOVICH JOSHUA E) 7 November 2000 (2000-11-07) the whole document ---	1-8
X	WO 96 05038 A (UNIV TEXAS) 22 February 1996 (1996-02-22) the whole document ---	1
Y		2-5, 7, 8
X	US 5 837 960 A (BARBE MICHAEL R ET AL) 17 November 1998 (1998-11-17) cited in the application example 1 ---	6
Y		2-4, 7, 8
Y	DE 196 49 865 C (FRAUNHOFER GES FORSCHUNG) 12 February 1998 (1998-02-12) column 5, line 2 - line 19 ---	5, 7
	--- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

12 December 2001

Date of mailing of the international search report

20/12/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Mathey, X

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 01/18160

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 40002 A (MASSACHUSETTS INST TECHNOLOGY ;CHILDRENS MEDICAL CENTER (US)) 19 December 1996 (1996-12-19) page 10, line 8 - line 18 ---	1
A	US 6 046 426 A (JEANTETTE FRANCISCO P ET AL) 4 April 2000 (2000-04-04) cited in the application the whole document ---	2-9
A	US 4 269 868 A (LIVSEY NORMAN B) 26 May 1981 (1981-05-26) the whole document ---	1-4,6-8
A	DE 43 15 757 C (PLUS ENDOPROTHETIK AG) 10 November 1994 (1994-11-10) the whole document ---	1-8
A	US 5 155 324 A (BEAMAN JOSEPH J ET AL) 13 October 1992 (1992-10-13) column 12, line 10 - line 30 -----	5
X		9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/18160

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6144008	A	07-11-2000	NONE	
WO 9605038	A	22-02-1996	US 5639402 A	17-06-1997
			AU 702229 B2	18-02-1999
			AU 3361495 A	07-03-1996
			EP 0775046 A1	28-05-1997
			JP 10508324 T	18-08-1998
			WO 9605038 A1	22-02-1996
			US 2001005797 A1	28-06-2001
			US 6183515 B1	06-02-2001
US 5837960	A	17-11-1998	NONE	
DE 19649865	C	12-02-1998	DE 19649865 C1	12-02-1998
			DE 59704479 D1	04-10-2001
			WO 9824574 A1	11-06-1998
			EP 0946325 A1	06-10-1999
			JP 2001504897 T	10-04-2001
			US 6215093 B1	10-04-2001
WO 9640002	A	19-12-1996	US 6176874 B1	23-01-2001
			CA 2222323 A1	19-12-1996
			EP 0836453 A1	22-04-1998
			JP 11507256 T	29-06-1999
			WO 9640002 A1	19-12-1996
US 6046426	A	04-04-2000	US 2001008230 A1	19-07-2001
US 4269868	A	26-05-1981	DE 3011022 A1	02-10-1980
			FR 2452528 A1	24-10-1980
			GB 2052566 A , B	28-01-1981
			IT 1130987 B	18-06-1986
			JP 1295026 C	26-12-1985
			JP 55131164 A	11-10-1980
			JP 60013431 B	06-04-1985
			US 4300474 A	17-11-1981
DE 4315757	C	10-11-1994	DE 4315757 C1	10-11-1994
			WO 9426213 A1	24-11-1994
			EP 0697843 A1	28-02-1996
			JP 8509645 T	15-10-1996
US 5155324	A	13-10-1992	US 4937420 A	26-06-1990
			US 5017753 A	21-05-1991
			US 4863538 A	05-09-1989
			AU 9016791 A	11-06-1992
			WO 9208567 A1	29-05-1992
			AT 116179 T	15-01-1995
			AT 138294 T	15-06-1996
			AT 138293 T	15-06-1996
			AU 603412 B2	15-11-1990
			AU 1046688 A	06-05-1988
			AU 659289 B2	11-05-1995
			AU 3524193 A	13-05-1993
			AU 632195 B2	17-12-1992
			AU 6834690 A	14-03-1991
			BG 47343 A3	15-06-1990
			BR 8707510 A	21-02-1989

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/18160

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5155324	A	DE 3750931 D1	09-02-1995
		DE 3750931 T2	11-05-1995
		DE 3751818 D1	27-06-1996
		DE 3751818 T2	26-09-1996
		DE 3751819 D1	27-06-1996
		DE 3751819 T2	26-09-1996
		DE 8718128 U1	01-02-1996
		DE 287657 T1	18-08-1994
		DK 329888 A	15-08-1988
		EP 0287657 A1	26-10-1988
		EP 0542729 A2	19-05-1993
		EP 0538244 A2	21-04-1993
		FI 882881 A , B,	16-06-1988
		HK 194796 A	01-11-1996
		HK 205796 A	22-11-1996
		HK 205896 A	22-11-1996
		HU 56018 A2	29-07-1991
		HU 209081 B	28-03-1994
		JP 2542783 B2	09-10-1996
		JP 6192702 A	12-07-1994
		JP 2800937 B2	21-09-1998
		JP 8260163 A	08-10-1996
		JP 1502890 T	05-10-1989
		JP 2620353 B2	11-06-1997
		KR 9608015 B1	19-06-1996
		KR 9613714 B1	10-10-1996
		MC 1931 A	19-05-1989
		NO 175244 B	13-06-1994
		NO 920877 A	16-08-1988
		RU 2021881 C1	30-10-1994
		WO 8802677 A2	21-04-1988
		US 5597589 A	28-01-1997
		US 5616294 A	01-04-1997
		US 5639070 A	17-06-1997